



XII.

LEAD IMPREGNATION

AND ITS

CONNECTION WITH GOUT AND RHEUMATISM.

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THE symptoms which manifest the injurious operation of lead upon the system have long been familiar to physicians, and have, more especially of late, been carefully studied. Epidemic Colic was described by Baillou and Riverius in the sixteenth, while in the succeeding century the same disease was with much accuracy delineated by Francis Citois, a physician of Poictou. The observations of Dr., afterwards Sir George Baker,¹ of Drs. Warren, Hardy, and John Hunter, besides other English physicians in the eighteenth century, satisfactorily determined that the peculiar form of colic noticed by the earlier writers, as well as the endemic disorder of Devonshire and Derbyshire, of Surinam, and other localities, was due to the same general cause, namely, the introduction of lead into the system. Since that time, under the names of Lead Colic, Saturnine or Painter's Colic, Colica Pictonum, and various other less distinctive

¹ 'An Essay Concerning the Cause of the Endemial Colic of Devonshire,' 8vo., London, 1767. Of this inquiry it has been truly remarked that it presents "one of the best examples modern times have afforded of the method to be pursued in medical inquiries, and constitutes a model for all who are labouring to extend the boundaries of medical science."—Dr. Munk's 'Roll of the Royal College of Physicians of London,' vol. ii.

appellations, the severe abdominal pain, usually the earliest in its appearance of the characteristic symptoms of lead impregnation, has been known and described. From a very early period, likewise, the peculiar and interesting form of local paralysis which occurs in connection with, for the most part succeeding, the colic had been noticed; the loss of power over one or both hands is well represented by Citois, for example, in the following words:—*Manibus ineurvis, etsuo pondere pendulis, nec nisi arte ad os et cæteras supernas partes sublatis.*” More recent observation of lead impregnation has shown, that the nervous system in this disorder is apt to be affected in two, though not in two separate and distinct ways; firstly, the nerves in particular parts of the body suffer; and, secondly, the nervous centres themselves become affected; the latter event occurs only in the severer forms of the disease, and, succeeding the paralysis, affords evidence of the contamination being more than usually powerful; this is shown in general convulsions attended by loss of consciousness. A very important corroborative proof of such symptoms as those now mentioned being due to lead impregnation, was first pointed out by Dr. Burton—namely, a blue or bluish line seen along the free margin of the gums, but absent where a tooth or stump is wanting. This blue colour Mr. Tomes has proved to result from a chemical action exerted by the lead which has entered the system upon the tartar of the teeth. In addition to these particulars of interest and importance relating to the diagnosis and pathology of lead impregnation, Dr. Garrod, first in 1854,¹ and again more fully in 1859,² has satisfactorily demonstrated that lead exerts a remarkable influence as a predisposing cause of gout. The general characters of lead impregnation are very well exhibited in the two cases, a short notice of which succeeds, while the relation of this disorder to gout is in them also very strikingly evidenced. These cases have occurred in the ordinary course of hospital experience, and are among several of the same nature of which I have preserved the record. I cannot confirm the statement made by a very eminent authority, Dr. Christison, that “poisoning from protracted exposure to lead is a very rare occurrence in Edin-

¹ ‘*Medico-Chirurgical Transactions*,’ vol. xxxvii, 1854, p. 181.

² ‘*The Nature and Treatment of Gout and Rheumatic Gout*,’ p. 281. London, 1859.

burgh,"¹ any more than my hospital experience leads me to regard "gout as occurring very rarely." That both disorders are more frequently met with in the hospitals of London than in our city does not admit of doubt, and, in explanation of this circumstance, reasons altogether satisfactory have been afforded; but, on the other hand, neither of them can, according to my own experience, be looked upon as at the present time of so unfrequent occurrence as the observations of Dr. Christison, just quoted, would tend to imply.

CASE 1.²—W. B—, æt. 30, a house-painter, admitted to Ward V., 6th May, 1862. Has followed the occupation of painter since he was thirteen, always mixing his own colours. For many years his habits have been intemperate. He has consumed porter and ale freely, but has very rarely indulged in whisky.

About four years ago, suffered for the first time from colic. This attack was slight; but in the course of twelve months was succeeded by a second, much more severe, and attended by great constipation. Since then he has suffered repeated attacks of colic, till thirteen months ago, when the earliest indications of paralysis appeared; the fingers of the right hand being first affected. The paralysis gradually increased, and, ten months ago, both hands were disabled. During this time he has had several severe convulsive seizures, attended by complete loss of consciousness. *On admission*, the patient presents a well-marked example of wrist-drop in both arms, and is quite unable to extend the hands. He can flex the latter, but not firmly or completely. The muscles of the upper-arm and shoulder are quite unaffected; the extensors of the fore-arm are evidently considerably wasted, and the muscles of both thumbs still more so. There is a good deal of tremulousness visible when movements of the upper limbs are made. There is no loss of power in the inferior extremities, and the patient voids water without any difficulty. The amount of urine is considerable; it is of pale colour, acid reaction, having a density of 1·010, with a very faint trace of albumen. The bowels are now no longer confined. A distinct blue line exists along the free margin of the gums, and the teeth are much discoloured. Was ordered as follows:—

R Potassii Iodidi, ʒij.

Aquæ Destillatæ, ʒxij.—*Solve.*

Sign. Sumat cochlearia duo ampla bis indies.

May 10th.—Complains of severe pain in the ball of the great toe of right foot, and also in the right ankle-joint. The former is considerably swollen and tender; the cutaneous surface is also reddened. Patient states that he has suffered greatly from pains in different joints, and that

¹ Dr. Garrod on 'Gout,' p. 284.

² Reported by Mr. Thomas Walker, B.A., clinical clerk.

on three former occasions the joint of the right great toe now affected has become of a bright red colour, much swollen, and exquisitely painful.

In addition to the iodide of potassium, the following prescription was ordered :

℞ Extracti Nucis Vomicæ, Extracti Colchici Acetici, ā ā, gr. vj.
 Alōini, Lupuliuæ, Extracti Hyoscyami, ā ā, gr. xij.—M.
 Fiat massa in pilulas æquales duodecim dividenda.
Sign. Una mane et vespere quotidie sumenda.

To have white fish and fowl, in addition to the common diet of hospital, withdrawing the boiled beef.

14th.—An improvement in the power of extending the hands, especially the left, has been noticed during the last few days. Gouty affection of foot has almost entirely disappeared. There exists very evidently, however, a chronic enlargement of this articulation, as well as of the corresponding one of the left foot, in which he also admits he has not unfrequently experienced severe pain. Is to-day suffering from a feverish attack. Ordered to keep bed, and omit the medicines prescribed.

19th.—Quite recovered from the febrile indisposition. Former treatment resumed.

From this date to 1st June continued to progress favorably. On the latter day was again feverish, and complained of palpitation, with pain, in the region of the heart. On auscultation, a bruit, following rather than accompanying the ventricular systole, was audible, most distinctly heard near the xiphoid cartilage. Pulse 120; pains felt in joints of arms and legs; tongue coated; breath foul. The iodide of potassium and pills were again omitted, and, after the operation of a purgative, the following mixture was commenced :

℞ Potassæ Nitratis, ʒij.
 Potassæ Acetatis, ʒvj.
 Aquæ, ʒviiij.—*Solve.*

Sign. Sumat cochleare magnum ex aquæ cyatho sextâ quâque horâ.

June 3rd.—Feverishness continuing. Bruit audible as before.

5th.—Heat of skin and frequency of pulse somewhat diminished. Bruit very distinct, heard along the whole sternum, but most clearly a little to the left of the xiphoid cartilage. Precordial pain recurs from time to time. Was dry-cupped to-day.

From this date to the 10th was still feverish. Occasionally slight delirium occurred by night. On two or three occasions manifested a tendency to faint, becoming pale, and with the pulse at the wrist very feeble. The urine more albuminous.

11th.—Decidedly improved. Bruit over heart less distinct. The abnormal sound has now more the character of slight roughness with the first sound. Pulse 108.

14th.—Iodide of potassium restored in three-grain doses thrice daily. Galvanism to muscles of forearm for a few minutes daily.

18th.—Completely recovered from arthritic attack.

Ordered as follows:

℞ Extracti Colchici Acetici, gr. iv.
 Extracti Nucis Vomicae, gr. vj.
 Ferri et Quinae Citratis, gr. xvij.
 Extracti Gentianae, q.s.—M.

Fiat massa in pilulas æquales duodecim dividenda; quarum sumat unam mane et vespere quotidie.

23rd.—Very rapid improvement in the condition of the wrists. Can now extend the hands, though not as yet perfectly. A small blistered surface has been produced over the back of both wrists, and to it half a grain of strychnine applied a few times.

July 1st.—Making rapid progress. Believes himself quite able to resume his employment, and is very anxious to do so. No longer complains of articular or muscular pains. Appetite good. Urine of higher colour, density 1·012, still very faintly coagulable. Rhythm, sounds, and action of heart normal. Pulse 74.

In this case we have the usual succession of the phenomena indicative of lead impregnation—the attacks of colic gradually increasing in severity, then the development of the characteristic form of local paralysis, speedily followed by the epileptic seizures, which emphatically proclaim its gravity; finally, the patient, after repeatedly suffering from gout in the ball of the great toe of right foot, becomes, while under our observation, the subject of an acute arthritic attack, in which the pericardium is evidently involved.

CASE 2.—J. H—, æt. 37, admitted to Ward V., June 8th, 1862. Has worked as a house-painter for more than nineteen years, generally mixing his own colours. For a lengthened period has suffered from pains in the belly, attended by sluggishness of the bowels. Three weeks ago these symptoms increased so much as to compel him to quit his work. Nausea and vomiting occurred about the same time. Has had no passage from the bowels for eight days. The belly is now considerably distended and hard. He suffers much pain, bending forwards and doubling himself up in the endeavour to obtain its mitigation. Has also pains, which he calls rheumatic, in the head, shoulders, and limbs. The patient states that, during the last eight or nine years he has had three distinct attacks of severe pain, attended by much swelling and redness, in the ball of the great toe of right foot. He has been accustomed for a lengthened period to drink pretty freely; and, while whisky has been his ordinary beverage, he admits that he has partaken more commonly than his fellows of both porter and ales. The gums present

an unusually distinct blue line. There is no paralysis, and no muscular atrophy. He has never had any fits.

Ordered a warm bath, and thereafter to take as follows:

℞ Tincturæ Opii, ℥xv.

Olei Ricini, ʒvj.

Aquæ Cinnamomi, ʒij.—M.

Fiat haustus: statim sumendus.

June 9th.—Bowels have been moved. Colicky pain, however, continues. The draught to be repeated. Has passed forty-five ounces of urine in the twenty-four hours. It is of normal colour, acid reaction, and of density 1·022, not coagulable.

10th.—Was ordered the iodide of potassium in ten-grain doses twice daily.

During the next few days the abdominal pain gradually diminished. The castor-oil was repeated daily, or on every alternate day.

16th.—Was discharged to-day at his own request, the pain in the belly having entirely ceased, but still feeling rheumatism pains. Advised to continue the use of the iodide of potassium for some time, but in smaller doses.

This case, much less severe in its nature than that of W. B—, being in fact one of simple lead colic without paralysis, still illustrates equally with his the association of lead impregnation and gout, and I beg to remark in connection with it, that in all its particulars it may be regarded as an apt example of cases which, to the number of nearly a dozen, have fallen under my observation during the last seven years—cases of lead colic, the sufferers from which have always complained of pains either in the limbs generally or in particular joints. Lately, I have seen a young man, J. M—, house-painter by occupation, and presenting the characteristic blue gingival line, who passed, three years ago, through a very severe attack of rheumatic endo-pericarditis, specially interesting in this particular, that, although there had been much complaint of flying pains through the limbs for many weeks before the true febrile accession occurred, the inflammation first attacked the heart, and, for several days before a single joint had suffered, there were the signs of effusion into the pericardium, as well as those of implication of the mitral valve. The patient now presents the undoubted signs of mitral insufficiency, and some among the less reliable indications of an adherent pericardium.

I have already observed that it is to Dr. Garrod we are indebted for pointing out the really intimate connection which

subsists between lead impregnation and gout. The curious fact had struck him that a very large proportion, at least one in four of the gouty patients who had come under his care in University College Hospital, had at some period of their lives been affected with lead poisoning, and for the most part followed the occupations of plumbers and painters. Keeping this subject prominently before his mind since 1854, the date of his earlier observation, Dr. Garrod has satisfied himself that persons following the trades referred to, are very frequently attacked with gout, much more so than other workmen in the same station of life.¹ In directing attention to this interesting inquiry Dr. Garrod has not lost sight of the bearing which other predisposing causes of gout may have in connection with lead impregnation, and chiefly the free use of fermented liquors. I am disposed to regard the difference in this respect which exists between the workmen in the south and in Edinburgh as of very great importance in determining the varied experience which physicians have had. Of the powerful predisposing influence exerted by fermented liquors there cannot exist any doubt, and it is equally well-ascertained that indulgence in distilled liquors does not create anything like the same proclivity to gout. In Edinburgh, whisky is the liquor ordinarily indulged in by the intemperate of the class from which our hospital patients are derived. Accordingly, while we see the injurious effects of such habits in the production of diseases of the nervous system, and specially in the frequency of delirium tremens, of hepatic, renal, and other visceral disorders, it is beyond doubt that gout is with us much less common than in the London hospitals, though, as I have already remarked, by no means so unfrequent in its occurrence as many have supposed. It will probably, I believe, be found that the association of lead impregnation with indulgence in fermented liquors gives a very strong predisposition to gout; and that, in the case of painters, those most subject to be injuriously affected by lead, the latter part of the required predisposition holds good, may, I venture to think, be true in London, for unquestionably as a class in Edinburgh they are not distinguished by sobriety. It is interesting to observe that in the two instances of lead impregnation with gout which I have

¹ See his 'Treatise on Gout,' p. 282.

now recorded, the patients, contrary to what ordinarily obtains with us, had indulged in *fermented* drinks; both were intemperate men; one had used porter and ales alone, the other, while usually taking whisky, had consumed more of the former than his comrades. The ale and porter drinker, though the younger man, has suffered more severely from gout than the consumer of distilled liquor as well as fermented drinks; and when lead impregnation in him was established, it presented itself in a form far more serious and unequivocal than in the latter. I cannot see that the greater attention to ablution after work, which has been assigned as a reason for the Edinburgh painters suffering less frequently from lead impregnation than the like artificers in London—the former living nearer their homes in most instances, and readily returning from work to meals—can adequately explain the difference which has been supposed to exist in respect to the frequency of the disorder in the two cities. In the Government works the greatest possible attention has been paid to ablution, thereby, however, nothing like immunity from lead impregnation has been attained. But, as already observed, I conceive the disorder to be of far more common occurrence in Edinburgh than has been stated.

Some very interesting observations have been made by Dr. Garrod, with the view of determining the particular manner in which lead acts as a predisposing cause of gout. He has carefully examined the condition of the blood and urine of patients under the influence of the saturnine poison; and he has likewise ascertained the effect which lead, when administered medicinally, has upon the secretion of uric acid. The important results generally obtained are now well known to the profession: the blood has been found to be rich in uric acid, or, at all events, abnormally charged with it, while this ingredient has been correspondingly deficient in the urine. Relying on the accuracy of Dr. Garrod's experiments, in neither of the cases detailed did I subject the blood to examination for uric acid, but in both it was ascertained that the amount of uric acid discharged from the system was very greatly diminished. In the case of W. B.—the urine was carefully examined by Dr. Murray Thomson on two occasions: the first within a day or two after the patient's admission to

the infirmary—he was then passing upwards of four pints in the twenty-four hours, and the amount of uric acid per pint was found to be 0·56 grain. On the subsequent examination, the flow of urine having increased, and a marked improvement in the symptoms of the patient having occurred, the amount of uric acid in the pint was determined to be 1·63 grain, or nearly three times as much as on the former analysis. In the case of the second patient, the sufferer from lead colic without paralysis, the urine was also examined by Dr. Murray Thomson. The whole quantity passed in twenty-four hours being forty-five ounces, yielded 2·80 grains of uric acid. One or two other particulars in respect to the urine in these cases call for remark. In the second case, though the amount of uric acid was greatly deficient, the density of the urine was as high as 1·022, the average amount of urea being excreted. Thus we have a proof of the lead impregnation interfering with the uric-acid excreting function of the kidneys, and with it alone, as well as of the fact that the elimination of uric acid by these organs may be at fault, while the integrity of the urea excretion remains unaffected. In the case of W. B— the urine has been of low density, and continues so; it is further very slightly coagulable; and although no microscopic element of importance has been detected, these are untoward indications, which must affect the prognosis we now entertain, seeing that with gout a particular form of renal disorder is very intimately connected, which form is likely to show itself at an early period by just such changes in the urine as those now noted. As respects the operation of lead taken medicinally on the system, Dr. Garrod has found that by it the amount of uric acid in the urine is decidedly reduced. Reference has already been made to a case of acute rheumatism with endo-pericarditis, and resulting in valvular disease. Its subject, a young painter, was of regular and sober habits, but for some time before his severe illness had been suffering from derangement of the stomach and bowels, and from articular pains. That the partial lead impregnation by which he was affected, played a part in predisposing him to the rheumatic seizure is, I am disposed to think, not unlikely, for I can call to remembrance two other cases in all essential particulars similar; and for several years, before, indeed, I had become aware of Dr. Garrod's valuable observations and ex-

periments, I had noticed the invariable occurrence of severe articular and muscular pains in all subjects suffering from lead impregnation whom I had had the opportunity of seeing. The fact appears to me significant in this and other cases of the same kind, that there had been no predisposition to gout acquired by indulgence in fermented drinks: had it been otherwise, then I submit as likely that gout and not rheumatism would have been the general disorder which followed.

I conclude with a single observation in respect to treatment. In these cases, as in several others, I have employed the iodide of potassium, as originally proposed and strongly recommended by M. Melsens. The urine was very carefully tested by Dr. Murray Thomson both before and after the administration of the remedy in the former case, and lead was not discovered. Granted that the kidneys are instrumental in effecting the removal of the poison, and that under the operation of such a remedy as the iodide of potassium its discharge is quickened—facts established by the observations of Dr. Fletcher of Dublin,¹ and those of Drs. Sieveking, Malherbe, Celtingen, and Dr. Parkes²—still the efficiency of the cutaneous surface as the more powerful emunctory, in some cases at least, must not be lost sight of. This is probably more likely to hold true in those instances in which the warm bath has constituted a special part of treatment, and in such as, like W. B—, suffer from some renal affection which may antagonise the removal of the lead by the latter channel. The employment of colchicum and iron in such cases as the former, and the judicious use of galvanism in all cases of saturnine paralysis have much to recommend them.

¹ 'Dublin Medical Press,' January, 1848.

² Dr. Parkes on the 'Composition of the Urine,' p. 164.



